REMARKS

With this amendment, claims 1-4, 6-14, 18-21, and 23-36 are pending. Claims 5, 15-17, and 22 are canceled. Claims 1, 2, 9, 12, 19, 20, and 21 are currently amended. Claims 23-42 are newly added. Support for the amendment to claim 1 can be found in the specification at p. 5, lines 27-30. Support for the amendment to claim 2 can be found in the specification at p. 7, lines 6-9. Support for the amendment to claims 9 and 19 can be found in original claim 2 and in the specification at p. 7, lines 6-9. Support for the amendment to claims 12 and 21 can be found in original claim 4. Support for the amendment to claim 20 can be found in original claim 3. Support for newly added claims 23-25 and 34-36 can be found in the specification at p. 3, lines 23-26; at p. 5, line 30 through p. 6, line 2; at p. 6, lines 15-19; and at p. 6, line 29 through p. 7, line 4. Support for newly added claims 26-29 and 37-40 can be found in the specification at p. 6, lines 15-19 and lines 27-28; and at p. 6, line 35 through p. 7, line 4. Support for newly added claims 30 and 31 can be found in the specification at p. 8, lines 7-9 and lines 24-26. Support for newly added claims 32 and 33 can be found in the specification at p. 8, lines 7-12 and lines 32-34. Support for claim 41 can be found in original claim 2 and in the specification at p. 7, lines 5-12. Support for claim 42 can be found in original claim 3 and in the specification at p. 7, lines 9-10.

I. Objection Under 37 C.F.R. 1.75(c)

Reconsideration is requested of the objection to claims 12-14 and 19-21 under 37 C.F.R. 1.75(c) as being improperly formed multiple dependent claims.

Claims 12-14 and 19-21 are not multiple dependent claims, as each depends from merely a single claim. However, in an effort to expedite prosecution of the application, applicants have amended each of the claims to incorporate language from the individual claims from which each of claims 12-14 and 19-21 depend, thereby rendering this rejection moot.

II. Rejection Under 35 U.S.C. 112, Second Paragraph

Reconsideration is requested of the rejection of claims 16 and 17 under 35 U.S.C. 112, second paragraph as being indefinite for failing to particularly point out and distinctly claim the subject matter regarded as the invention.

The Office rejected claims 16 and 17 for depending from canceled claim 15. Applicants have canceled claims 16 and 17, thereby rendering this rejection moot.

III. Rejection Under 35 U.S.C. 112, First Paragraph

Reconsideration is requested of the rejection of claims 1-3, 6-11, and 16-18 under 35 U.S.C. 112, first paragraph, for lack of written description.

The Office states that three specifically deposited attenuated viruses, designated C3464, C3490, and C3605, possessing both the cold adapted and temperature sensitive phenotypes have been fully described in the specification, but that while one of skill in the art would reasonably conclude that applicants were in possession of these three attenuated viruses, there is no indication that the three viruses provide a showing that applicants were in possession of an entire genus of such viruses.

The standard for determining whether sufficient written description exists is whether the description allows persons of ordinary skill in the art to recognize that the inventor had possession of the claimed invention at the time of filing, "even if every nuance of the claims is not explicitly described in the specification."[1] Moreover, there is a ***strong*** presumption that adequate written description of the claimed invention is present in the originally filed claims.[2] Consequently, rejection of an original claim for lack of written description *should be rare*.[3]

Claim 1 is directed to an isolated, attenuated viral strain of human parainfluenza virus 2, wherein the viral strain is temperature sensitive and cold adapted. Characteristics of the attenuated viral strains are well described in the specification. Specifically, the attenuated viruses are temperature sensitive. Methods of determining whether such an attenuated HPIV-2 strain is temperature sensitive are disclosed in the specification such that this particular characteristic of the attenuated strains is easily determined and identified.[4]

The attenuated strains are also are cold adapted. Methods of determining whether such an attenuated HPIV-2 strain is cold

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[1] *In re Alton*, 76 F.3d 1168, 1175 (Fed. Cir. 1996); *see also*, *Vas-Cath Inc. v. Mahurkar*, 935 F.2d 1555, 1557 (Fed. Cir. 1991).

[2] *In re Wertheim*, 541 F.2d 257, 262 (C.C.P.A. 1976)(emphasis added).

[3] "Guidelines for the Examination of Patent Applications Under the 35 U.S.C. 112, ¶1, 'Written Description Requirement'" 66 Fed. Reg. 1099 (Jan. 5, 2001)(emphasis added; hereinafter "Guidelines").

[4] Specification, p. 7, lines 5-12.

adapted are disclosed in the specification such that this particular characteristic of the attenuated strains is easily determined and identified.[5]

Accordingly, specific characteristics that are possessed by and that describe the claimed attenuated viruses are well described in the specification.

Moreover, the disclosure of particular species disclosed within the specification provide sufficient written description support for a claim directed to the genus which encompasses the species. It is well settled that the written description requirements of a claimed genus can be met by a sufficient description of a "representative number of species."[6] Furthermore,

> [a] "representative number of species" means that the species which are adequately described are representative of the entire genus. . . . [T]here may be situations where one species adequately supports a genus [*citing*, *Rasmussen*, 650 F.2d 1212, 1214 (C.C.P.A. 1981); *In re Herschler*, 591 F.3d 693, 697 (C.C.P.A. 1979); *In re Smythe*, 480 F.2d 1376, 1383 (C.C.P.A. 1973); *cf*, *Tronzo v. Biomet*, 156 F.3d 1154, 1159 (Fed. Cir. 1998)]. . . . Satisfactory disclosure of a "representative number" depends on whether one of skill in the art would recognize that the applicant was in possession of the necessary common attributes or features of the elements possessed by the members of the genus in view of the species disclosed. . . . Description of a representative number of species does not require the description to be

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[5] Specification, p. 7, lines 13-22.

[6] *University of California v. Eli Lilly & Co.*, 119 F.3d 1559, 1568 (Fed. Cir. 1997).

of such specificity that it would provide individual support for each species that the genus embraces.[7]

Therefore, the Guidelines, along with the case law cited therein, establish that in order to determine whether there is a disclosure of a "representative number of species," the question to be answered is whether one of ordinary skill in the relevant art would recognize from the disclosure that applicants were in possession of the "necessary common attributes or features of the elements possessed by the members of the genus in view of the species disclosed."[8] This can be accomplished by describing the invention based upon various characteristics, individually or in combination, or by describing a representative number of species within that genus, said representative number of species being as few as one when the knowledge and skill of one in the art are high.

Exemplary attenuated strains are described in the specification. Seven attenuated strains (C3396, C3464, C3490, C3457, C3440, C3444, C3605), three of which were deposited with the American Type Culture Collection (ATCC) (C3464, C3490, and C3605),[9] display the characteristics of temperature sensitivity and cold adaptation as discussed above. One of ordinary skill in the relevant art would recognize from the disclosure of the particular attenuated strains that applicants were in possession of the "necessary common attributes or features of the elements

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[7] Guidelines, 66 Fed. Reg at 1106.

[8] Guidelines, 66 Fed. Reg. at 1106.

[9] A copy of the ATCC deposit certificate evidencing the deposit of these three strains was enclosed with Amendment A dated October 3, 2001.

possessed by the members of the genus in view of the species disclosed"[10] - namely that the attenuated HPIV-2 strains possess the common features of temperature sensitivity and cold adaptation. Accordingly, the exemplary attenuated viral strains possessing the temperature sensitive and cold adapted characteristics disclosed in the specification constitute a representative number of species sufficient to support a claim directed to the genus of which the species are members.

The Office relies on several cases that relate specifically to the isolation of biomolecular or chemical sequences[11] for the proposition that written description must be supported by identifying characteristics such as nucleotide or amino acid sequences, chemical structure, molecular weight, and binding affinity. Notably, however, applicants are not claiming a particular gene, protein, or chemical such that the recitation of characteristics such as nucleotide/amino acid sequences or molecular weights are necessary to confer to one of skill in the art that applicants are in possession of the claimed invention. Instead, applicants are claiming attenuated HPIV-2 strains that possess the particular characteristics and properties of temperature sensitivity and cold adaptation. Salient characteristics of these strains are clearly and plainly described in the present specification such that a person of

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[10] Guidelines, 66 Fed. Reg. at 1106.

[11] *In re Bell*, 26 U.S.P.Q.2d 1529-1532 (C.A.F.C. 1993); *Fiers v. Sugano*, 25 U.S.P.Q.2d 1601-1607 (C.A.F.C. 1993); and *University of California v. Eli Lilly*, 119 F.3d 1559, 43 U.S.P.Q.2d 1398 (Fed. Cir. 1997).

ordinary skill in the art would recognize that the applicants had possession of the claimed invention at the time of filing.[12]

The Office also asserts that written description is lacking because "the issue of lack of reproducibility is raised since RNA genomes are known for their infidelity; similarly, weakly attenuated RNA strains are often revertant."[13]

Applicants note that such issues are neither relevant to nor determinative of whether adequate written description support exists for the claimed HPIV-2 strains. That notwithstanding, the specification discloses that each of clones C3440, C3464, and C3490 were tested for genetic stability *in vitro*, and that each retained its temperature sensitive phenotype after serial passage at 39°C, thereby indicating that each of the attenuated strains was genetically stable.[14] Moreover subclones of these three strains were similarly tested. The results indicate that all of the subclones of C3490 and C3464 retained a single temperature sensitive phenotype. And although the subclones of C3440 were of a mixture of at least two phenotypes, all the subclones still retained the temperature sensitive characteristics described in the specification.[15] A disclosure of genetic stability is similarly described in Example 5.[16]

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[12] *In re Alton*, 76 F.3d 1168, 1175 (Fed. Cir. 1996); *see also*, *Vas-Cath*, 935 F.2d at 1557.

[13] Office action of August 18, 2003, at p. 6.

[14] Specification, Example 2, p. 10, lines 8-16.

[15] Specification, Example 2, p. 10, lines 7-26.

[16] Specification, Example 5, p. 12, lines 4-28.

Accordingly, the attenuated strains of claims 1-3 are adequately supported by the specification. Claims 6-11, directed to vaccines comprising the attenuated HPIV-2 strain of claims 1-3, and claim 18, directed to a method of inducing a protective immune response in a mammal comprising administration of the attenuated HPIV-2 strain of claim 1, were also rejected for lack of written description support for the attenuated HPIV-2 strains serving as the basis of those claims. As the arguments above demonstrate written description support for the attenuated HPIV-2 viral strains of claims 1-3, they likewise provide support for the same attenuated HPIV-2 viral strains that serve as the basis of claims 6-11 and 18.

Claims 16 and 17 are canceled with this amendment, thereby rendering the rejection as applied to these claims moot.

IV. Rejection Under 35 U.S.C. 102(e)

Reconsideration is requested of the rejection of claims 1-3, 6-11, and 16-18 under 35 U.S.C. 102(e), as being unpatentable over Belshe et al. (U.S. Patent No. 5,869,0365) (hereinafter "Belshe et al. ('036)").

Claim 1 is directed to a an isolated, attenuated viral strain of human parainfluenza virus 2 (HPIV-2), wherein the viral strain is temperature sensitive and cold adapted.

Claim 6 is directed to a vaccine composition comprising an isolated, attenuated viral strain of HPIV-2, wherein the viral strain is temperature sensitive and cold adapted.

Claim 18 is directed to a method of inducing a protective immune response in a mammal. The method comprises administering to the mammal an amount of an isolated, attenuated viral strain of HPIV-2 sufficient to elicit the protective immune response,

and wherein the viral strain is temperature sensitive and cold adapted.

Belshe et al. ('036) disclose that the temperature sensitive phenotype of the cp45 strain of human parainfluenza virus 3 (HPIV-3) is caused by a mutation in the large (L) gene of cp45 relative to the wild-type strain - specifically, substituting histidine for tyrosine at residue 942 in the L gene, phenylalanine for leucine at residue 992 in the L gene, and/or isoleucine for threonine at residue 1558 of the L gene. Belshe et al. ('036) further disclose hybrid viruses having chimeric genomes comprising the temperature sensitive cp45 L nucleotide sequence and at least one nucleic acid sequence which encodes at least one surface antigen of an envelope target virus. In one embodiment, the hybrid virus comprises a nucleic acid sequence which is the same as the nucleic acid sequence of the 3' leader region of a cp45 viral genome; nucleic acid sequences which encode the nucleocapsid protein, [NP], the phosphoprotein, P[+C], and the matrix protein, [M], of cp45; a nucleic acid sequence which encodes at least one surface antigen (*e.g.* surface protein or surface glycoprotein) of an enveloped target virus; and a nucleic acid sequence which encodes a variant protein which is different from the L protein of wild-type HPIV-3.[17]

Unlike the present claims, Belshe et al. ('036) do not disclose an isolated, attenuated HPIV-2 virus. Instead, Belshe et al. ('036) disclose the modification of the L gene of HPIV-3 in order to achieve a temperature sensitive phenotype of HPIV-3, namely cp45, and the alteration of the targeting of that viral phenotype by the substitution of nucleic acid sequences encoding

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[17] Belshe et al., U.S. Patent No. 5,869,036 at column 9, lines 8-19.

surface antigens of other enveloped, negative-sense, single stranded RNA target viruses - particularly, HPIV-1, HPIV-2, and RSV. Notably, Belshe et al. ('036) refer to this virus as a **cp45 hybrid virus**, disclosing that the method for producing such an attenuated HPIV-3 virus involves inserting the target virus gene sequences "**into the cp45 genome** in place of the corresponding surface glycoprotein genes **in the cp45 genome**."[18] As submitted by Belshe et al. ('036), the manipulation performed therein resulted in an attenuated HPIV-3 virus with an altered targeting specificity and not a temperature sensitive and cold adapted HPIV-2 viral strain. This is especially appreciated in light of the fact that the only HPIV-2 components present in the various embodiments of the cp45 hybrid virus disclosed in Belshe et al. ('036) are the nucleic acid sequences encoding the surface antigens of HPIV-2. Accordingly, Belshe et al. ('036) do not disclose an attenuated viral strain of HPIV-2, wherein the viral strain is temperature sensitive and cold adapted, and therefore do not demonstrate each and every element of claims 1, 6, and 18.

Claims 2 and 3, which depend from claim 1, and claims 7-11, which depend from claim 6, are patentable over Belshe et al. ('036) for the reasons stated above with respect to claims 1 and 6 and by reason of the additional elements which they introduce.

Claims 16 and 17 have been canceled, thereby rendering the rejection as applied thereto moot.

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[18] Belshe et al., U.S. Patent No. 5,869,036 at column 9, lines 54-59.

V. Rejection Under 35 U.S.C. 103(a)

Reconsideration is requested of the rejection of claims 1-3, 6-11, and 16-18 under 35 U.S.C. 103(a), as being unpatentable over Belshe et al. (Journal of Medical Virology, 10:235-242 (1982)(hereinafter "Belshe et al. (1982)") in view of Belshe et al. ('036).

Belshe et al. (1982) disclose the cold passaging of a wild type strain of HPIV-3 to achieve a temperature sensitive and cold adapted strain of HPIV-3 (cp45). The cp45 strain is achieved by the cold passaging of the HPIV-3 wild type virus 10 times at 22°C. Progressive enrichment of the cp45 virus pool is further achieved by an additional 35 passages of the virus at 20°C. Belshe et al. (1982) do not disclose an isolated, attenuated viral strain of HPIV-2, wherein the viral strain is temperature sensitive and cold adapted, or the method of achieving a temperature sensitive and cold adapted viral strain by the stepped reduction of passaging temperatures.

As discussed above in Section IV, Belshe et al. ('036) disclose the attenuated HPIV-3 virus cp45,[19] and the alteration of the targeting specificity of that virus, resulting in what was referred to as a cp45 hybrid virus. Belshe et al. ('036) do not disclose an isolated, attenuated viral strain of HPIV-2, wherein the viral strain is temperature sensitive and cold adapted or a method of achieving a temperature sensitive and cold adapted HPIV-2 viral strain by the stepped reduction of passaging temperatures.

The Office has failed to establish a *prima facie* case of obviousness, as the references, when combined, fail to teach each

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[19] This is the same attenuated virus disclosed in Belshe et al. (1982).

and every element of the claims.[20] Specifically, as discussed above, each of the references fails to disclose an isolated, attenuated viral strain of HPIV-2, wherein the viral strain is temperature sensitive and cold adapted. Instead, each reference discloses an attenuated viral strain of HPIV-3. Belshe et al. (1982), according to the Office action, merely disclose isolated, cold adapted (attenuated) HPIV-3 (cp45) and methods of achieving the same.[21] The only reference to HPIV-2 in Belshe et al. ('036) is the disclosure of surface glycoproteins in the wild type virus and the manner in which the same may be used to alter the targeting of a cp45 hybrid virus. There is no disclosure of attenuated HPIV-2 strains that are temperature sensitive and cold adapted or any disclosure as to how the same could be achieved. Because the combination of references fails to teach or suggest all such claim elements, the Office has failed to establish a *prima facie* case of obviousness.[22]

In addition, the Office has failed to establish a *prima facie* case of obviousness as there is no motivation or suggestion within the references themselves or in the knowledge generally available to one of skill in the art to modify or combine the reference teachings.[23] Specifically, Belshe et al. (1982) disclose that temperature sensitive and cold adapted HPIV-3 viral strains can be achieved by simply passaging HPIV-3 **ten times at 22°C**. Accordingly, Belshe et al. (1982) suggest to one of skill

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[20] MPEP §2142.

[21] Office action of August 18, 2003, at p. 7.

[22] MPEP §2142.

[23] MPEP §2142.

in the art that temperature sensitive and cold adapted human parainfluenza viruses can be achieved ***simply by immediately passaging the wild-type virus at the desired temperature***.

However, to the contrary, the present specification discloses that use of the method of passaging disclosed in Belshe et al. (1982) would not achieve the presently claimed attenuated HPIV-2 viral strains. Specifically, applicants state that they "were surprised to find that the cold-passaging temperature had to be stepped down gradually in order to successfully adapt HPIV-2 virus, ***unlike HPIV-3***, **which can be immediately cold passaged at 22°C.**"[24] Accordingly, as a stepped reduction in temperature is not suggested in either Belshe et al. (1982) or Belshe et al. ('036), both references lack the necessary motivation or suggestion to modify or combine the reference teachings.[25] In fact, the disclosure of Belshe et al. (1982) teaches away from the claimed invention, by incorrectly suggesting to one of skill in the art that attenuated strains of HPIV-2 may be achieved by immediately passaging a wild-type strain at the desired temperature.

With respect to the Office's assertion that one of skill in the art would have an expectation of success in the production of an attenuated HPIV-2 virus "since the specification clearly states (at page 8) that one of skill would be able to make and isolate attenuated clones from wild type HPIV-2 using routine methods,"[26] applicants note that such a statement is taken out of

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[24] Specification, p. 6, lines 29-31 (emphasis added).

[25] MPEP §2142.

[26] Office action dated August 18, 2003, p. 8.

context, lacking an important qualifying preface. The full statement at pages 7-8 of the specification is "***Following the examples and teachings set forth in this specification***, one of ordinary skill in the art would be able to develop and isolate ts [temperature sensitive] and ca [cold adapted] clones from wild type HPIV-2 virus using routine methods."[27] The entire statement clearly indicates that a person of skill in the art, once equipped with the knowledge obtained from the disclosure in the specification, may then apply routine methods in conjunction therewith to achieve additional attenuated HPIV-2 clones. This statement notwithstanding, the fact remains that even if one of skill in the art would have had an expectation of success in applying the methods disclosed in Belshe et al. (1982), as discussed above one of skill in the art still would not have achieved the claimed invention.[28]

Accordingly, the Office has failed to establish a prima facie case of obviousness with respect to claims 1, 6, and 18.

Claims 2 and 3, which depend from claim 1, and claims 7-11, which depend from claim 6, are patentable over Belshe et al. (1982) in view of Belshe et al. ('036) for the reasons stated above with respect to claims 1 and 6 and by reason of the additional elements which they introduce.

Claims 16 and 17 are canceled with this amendment, thereby rendering the rejection as applied to these claims moot.

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[27] Specification, p. 8, lines 6-8 (emphasis added).

[28] *See*, specification, p. 6, lines 29-31, stating that applicants "were surprised to find that the cold-passaging temperature had to be stepped down gradually in order to successfully adapt HPIV-2 virus, unlike HPIV-3, which can be immediately cold passaged at 22°C."

VI. Newly Added Claims

A. Claims 23-33

Newly added claim 23 is directed to an isolated, attenuated viral strain of claim 1, wherein the virus is produced by a stepped reduction in temperature. The method comprises the steps of (a) culturing *in vitro* a wild type human parainfluenza virus 2 (HPIV-2); (b) cold passaging said virus at a first temperature; (c) selecting viruses that grow at the first temperature; (d) cold passaging the selected viruses at a second temperature, the second temperature being less than the first; and (e) selecting viruses that grow at the second temperature.

Claim 23 is patentable over Belshe et al. ('036) and over Belshe et al. (1982) in view of Belshe et al. ('036) for the reasons stated above with respect to claim 1.

Claims 24-29, which depend from claim 23, are patentable over Belshe et al. ('036) and over Belshe et al. (1982) in view of Belshe et al. ('036) for the reasons stated above with respect to claim 23 and by reason of the additional elements they introduce.

Newly added claims 30 and 31 are directed to vaccine compositions comprising the isolated, attenuated viral strains of claims 23 and 26, respectively. As claims 23 and 26 are patentable for the reasons discussed above, claims 30 and 31 directed to vaccines comprising the isolated, attenuated viral strains of claims 23 and 26 are likewise patentable.

Newly added claims 32 and 33 are directed to methods of inducing protective immune responses in mammals by administering to the mammals the isolated, attenuated viral strains of claims 23 and 26, respectively. As claims 23 and 26 are patentable for the reasons discussed above, claims 32 and 33 directed to methods

of inducing protective immune responses in mammals comprising administration of the isolated, attenuated viral strains of claims 23 and 26 are likewise patentable.

B. Claims 34-42

Newly added claim 34 is directed to a method of producing an isolated, attenuated viral strain of human parainfluenza virus 2, wherein the viral strain is temperature sensitive and cold adapted. The method comprises the steps of (a) culturing in vitro a wild type human parainfluenza virus 2 (HPIV-2); (b) cold passaging said virus at a first temperature; (c) selecting viruses that grow at the first temperature; (d) cold passaging the selected viruses at a second temperature, the second temperature being less than the first; and (e) selecting viruses that grow at the second temperature.

Claim 34 is patentable over Belshe et al. ('036) as they do not disclose a method of producing an isolated, attenuated viral strain of human parainfluenza virus 2, wherein the viral strain is temperature sensitive and cold adapted, by the passaging of an HPIV-2 virus with a stepped reduction of the passaging temperatures. Likewise, claim 34 is patentable over Belshe et al. (1982) in view of Belshe et al. ('036) for the same reason. Moreover, as discussed above with respect to claim 1, there is no motivation or suggestion within Belshe et al. (1982) and Belshe et al. ('036), either individually or in combination, or in the knowledge generally available to one of skill in the art, to modify or combine the reference teachings.

Claims 35-42, which depend from claim 34, are patentable over Belshe et al. ('036) and over Belshe et al. (1982) in view of Belshe et al. ('036) for the reasons stated above with respect to claim 34 and by reason of the additional elements they introduce.

CONCLUSION

In light of the above arguments, Applicants respectfully request reconsideration and withdrawal of the objection of claims 12-14 and 19-21 under 37 C.F.R. 1.75(c); the rejection of claims 16 and 17 under 35 U.S.C. 112, first paragraph; the rejection of claims 1-3, 6-11, and 16-18 under 35 U.S.C. 112, first paragraph; the rejection of claims 1-3, 6-11, and 16-18 under 35 U.S.C. 102(e); the rejection of claims 1-3, 6-11, and 16-18 under 35 U.S.C. 103(a); and allowance of the application. If the Examiner feels, for any reason, that a personal interview will expedite the prosecution of this application, she is invited to telephone the undersigned.

Applicants request an extension of time to and including December 18, 2003, for filing a response to the above-mentioned Office action. A check in the amount of the applicable extension fee is enclosed. The Commissioner is hereby authorized to charge any deficiency or any overpayment in connection with this amendment to Deposit Account No. 19-1345.

Respectfully submitted,

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